instruction manual

175

PROPERTY OF DEPT. C-270
METROLOGY LAB
DO NOT REMOVE
FROM AREA

TELEDYNE ANALYTICAL INSTRUMENTS
333 WEST MISSION DRIVE, SAN GABRIEL, CALIFORNIA 91776, (213) 283-7181 • 576-1633 • TWX 910-589-1605

INSTRUCTION MANUAL

FOR

COMBUSTIBLES SYSTEM

MODEL 175

PROPERTY OF DEPT. C-270
METROLOGY LAB.
DO NOT REMOVE
FROM AREA

SERIAL NUMBER
378

CUSTOMER ORDER NUMBER
8CZ553529-9

SALES ORDER NUMBER
86838

TELEDYNE ANALYTICAL INSTRUMENTS
333 WEST MISSION DRIVE
SAN GABRIEL CALIFORNIA 91776

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MODEL 175 SYSTEM
COMBUSTIBLE GAS MONITOR

OPERATING INSTRUCTIONS

1. INTRODUCTION

1.1 Description. The combustible monitor consists of two parts; first is the control unit which houses all of the calibration controls, the meter readout, the alarm relays and the power supply. The second part consists of the sensor, flowmeters, valves and heater circuit. All of the above are mounted within a weather-proof enclosure suitable for bulkhead mounting.

1.1.1 The sensing element is a low temperature catalytic type used in a DC constant current-excited bridge network. The bridge has two legs exposed to the atmosphere to be sampled.

1.1.2 All operating controls and indicators are accessible from the front panel. Those that are used for normal operation are exposed directly; those that are used only during calibration or servicing are recessed behind the front panel.

1.1.3 Exposed Controls and Indicators

1.1.3.1 The power toggle switch is used to turn the system on and off.

1.1.3.2 The prominent meter displays the gas concentration as a percentage of the combustible gases and is graduated from 0 to 5% combustibles.

1.1.3.3 The green NORMAL light is illuminated during normal operation and indicates that the sensing element is operating properly.

1.1.3.4 The red ALARM light is illuminated either when the gas concentration rises above the adjustable alarm set point or in the event of an element circuit malfunction. The two conditions can easily be distinguished by looking at the meter reading. In a gas alarm, the meter pointer will be up-

scale above the predetermined level. In a malfunction type alarm the meter needle will be downscale below zero. A malfunction alarm will be caused by low or no element current, sensing element removal, etc.

1.1.3.5 The BUZZER toggle switch enables the internal buzzer to sound if the unit goes into alarm.

1.1.3.6 The RESET toggle switch determines the mode of the alarm relay. In the AUTO position, the alarm relay will pull in and drop out automatically as the gas concentration goes above and below the set point. In the MANUAL position, the alarm relay will be in a latching mode such as to pull in if the gas concentration goes above the set point, the alarm system can be reset to normal by switching back to AUTO.

1.1.4 Recessed Controls

1.1.4.1 The recessed controls are for calibration and servicing purposes and should only be used as such.

1.1.4.2 The SPAN control adjusts for manufacturing variations in sensitivity between elements and for various gases.

1.1.4.3 The ZERO control adjusts for zero meter reading with zero gas (air) flowing through the sensor cell.

1.1.4.4 The ALARM control allows the point at which the unit goes into alarm to be adjusted anywhere between 0% and 5% combustibles as shown by the meter reading.

1.1.5 Meter Trim. The small potentiometer located on the main circuit board below the meter is used to trim the meter to full scale deflection at the rated output. This control is set at the factory.

1.1.6 Analog Output. An analog output signal is provided for remote monitoring or recording. This signal may be a voltage or current signal at the customer's option.

1.1.6.1 Analog Voltage Output. This output is representing full scale excursion on the panel meter. The remote meter or recorder should have an input impedance

greater than 1000 ohms.

1.1.6.2 Analog Current Output. The following current outputs are available. The remote current meter or recorder should have an input impedance less than the indicated maximum values.

CURRENT OUTPUT	MAXIMUM LOAD IMPEDANCE
1 - 5 ma	6 K ohms
4 -20	1.5K ohms
10 -50	600 ohms

1.1.7 Air Dilution. It is necessary to insure that there will always be sufficient oxygen in the sample being analyzed to insure full combustion of any combustible gases present. This is accomplished by blending an equal amount of "clean" compressed air with the sample gas. Two flowmeters are used so that an equal flow of both sample and air can be visually set.

The flowmeters, valves, sensor and associated plumbing are mounted within a temperature controlled box. The temperature is held at about 130°F. This is done to keep all components above the dew point of the sample gas.

2. STARTUP AND CALIBRATION

The combustible monitor comes ready to operate. Power is connected to it through a terminal strip on the back plate of the enclosure. Alarm relay and analog output terminals are located on this same terminal strip. (Refer to Interconnection Drawing in the rear of the manual.)

When ready to operate, use the following startup and calibration procedure:

1. Turn on the air supply and adjust the air regulating valve on the valve panel until a flowrate of 2 scfh is indicated on the lefthand flowmeter. It is important that the air supply pressure be well regulated in order to maintain a constant flowrate.

2. Turn on the power switch of the combustible monitor control unit. Wait about five minutes for the unit to warm up.

3. Be sure that the sample and span toggle valves are shut off and that only air is flowing through unit.

4. After air has been flowing for a couple of minutes, adjust zero control on control unit (use small screw driver supplied) until meter pointer lines up with zero mark on the dial. (Be sure mechanical zero of meter is adjusted with power off first.)

5. Turn on supply of span gas and open the span toggle valve. Then adjust the span flow control valve until a flowrate of 2 scfh is indicated on the righthand flowmeter. NOTE: Flowrate of span gas should be set to match that of the air as closely as possible. (It does not matter if they do not read exactly 2 scfh as long as they are both the same.)

6. Adjust the span control with the small screw driver until the meter pointer reads the analyzed value of the span gas.

7. If only a very small or no adjustment was required, no further calibration should be needed. If, however, a fairly large adjustment was made, the zero adjustment should be rechecked and readjusted, as necessary. If zero readjustment was made, check span adjustment again. Be sure to close the span toggle valve when you are finished.

8. Adjust the alarm set point to the desired level. The alarm is adjusted by turning zero control until meter reads desired alarm point. Alarm level control is then adjusted until alarm light just comes on. Be sure to readjust the zero to its correct setting when you are finished.

9. Once the above adjustments have been made, the unit is ready for service. Open the sample toggle valve and adjust the sample flow control valve until the indicated flowrate matches that of the air supply.

3. SPAN GAS

It is recommended that the span gas have a concentration of 4.0-4.8% methane or other desired combustible gas with the balance being Nitrogen. It is IMPORTANT that the dilution air flow is never

turned off during operation or calibration. Combustibles without at least a 2 to 1 ratio of oxygen should never be allowed to flow past the sensor, or loss of sensitivity will occur, and the unit will require complete recalibration and possible sensor replacement.

NOTE: The range of the combustible monitor is 0-5% combustibles; however, it is actually operating at a sensitivity of 0-2.5% combustibles (Methane equivalent) due to the one to one dilution with air.

MODEL 175

SPARE PARTS LIST

QUANTITY	PART NO.	DESCRIPTION	UNIT PRICE *
2	B-12115	Sensors	$ 75.00
1	H-28	Heater	27.00
1	T-199	Thermoswitch 135°F	21.70
1	R-179	Relay	14.40
5	F-6	Fuses; 3AG, ¼ Amp.	.75
2	L-32	Lamps	1.35
2	A-38	Amplifier	3.45
1	R-565	Volt. Reg.	6.00
1	R-564	Volt. Reg.	9.00

* Prices subject to change without notice. A minimum charge of $15.00 applies to spare parts orders.

IMPORTANT: Orders for replacement parts should include the above part number, and the model and serial number of the system for which the parts are intended.

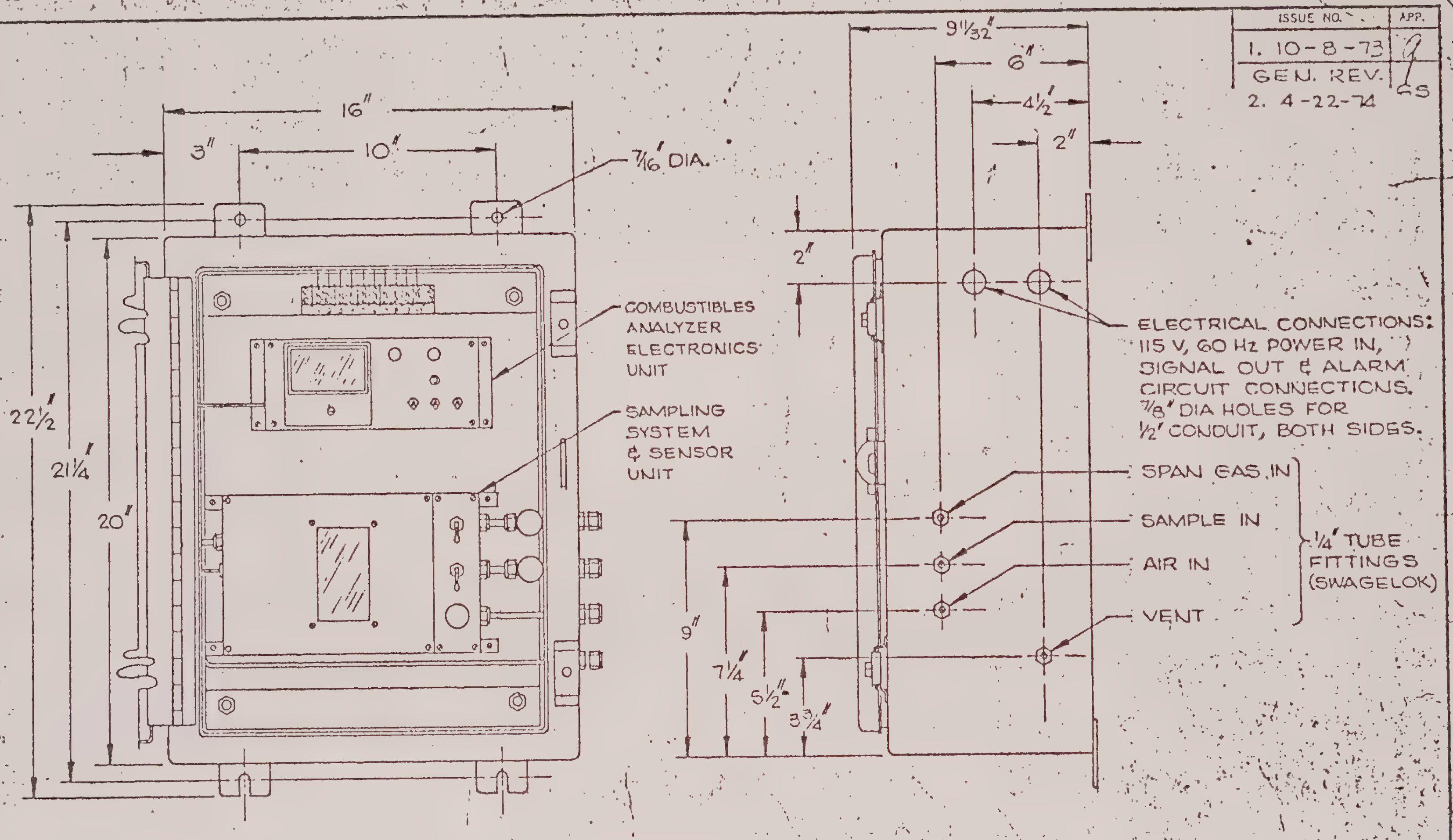
Orders should be sent to:

TELEDYNE ANALYTICAL INSTRUMENTS
333 West Mission Drive
San Gabriel, California 91776

Rev. 3-1-77

DRAWING LIST

B-11615	OUTLINE DIAGRAM
A-11618	INTERCONNECTION DIAGRAM
A-11043	PIPING SCHEMATIC
B-11619	WIRING DIAGRAM
C-11751	ANALYZER SCHEMATIC


16″
3″
10″
7/16″ DIA.
22½″
21¼″
20″
COMBUSTIBLES ANALYZER ELECTRONICS UNIT
SAMPLING SYSTEM & SENSOR UNIT
9 11/32″
6″
4½″
2″
2″
ELECTRICAL CONNECTIONS: 115 V, 60 Hz POWER IN, SIGNAL OUT & ALARM CIRCUIT CONNECTIONS. 7/8″ DIA HOLES FOR ½″ CONDUIT, BOTH SIDES.
SPAN GAS IN
SAMPLE IN
AIR IN
VENT
¼″ TUBE FITTINGS (SWAGELOK)
9″
7¼″
5½″
3¾″
ISSUE NO.
APP.
1. 10-8-73
GEN. REV.
2. 4-22-74
GS

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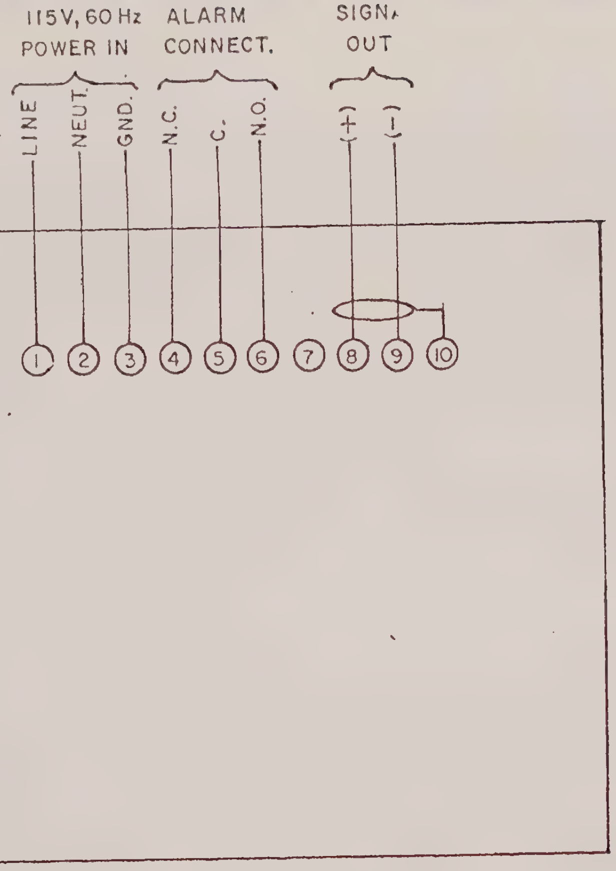
TOLERANCE UNLESS OTHERWISE SPECIFIED	FRACT. ± 1/64	DEC. ± .005	ANGULAR ± 1/2°
ANALYTICAL INSTRUMENTS A TELEDYNE COMPANY SAN GABRIEL, CALIFORNIA		SCALE 1:4	DATE 10-8-73
		MATL ~	
		FINISH ~	
COMBUSTIBLES ANALYZER MDL 175 OUTLINE DIAGRAM		DR 3.S.	ENGR / APP
		B-11615	

I. 10-9-73 g



NOTES: GROUND SHIELD OF SIGNAL CABLE AT ANALYZER ONLY (SHIELD NOT REQ'D FOR I OUTPUT) AS SHOWN. DO NOT GROUND EITHER OUTPUT SIGNAL LEADS.

POWER & SIGNAL LEADS SHOULD BE PLACED IN SEPARATE CONDUITS. (NOT REQ'D FOR I OUTPUT)

WIRE RECOMMENDATIONS:

SIGNAL : 22 GA. SHIELDED CABLE

POWER & GROUND : 16 GA.

ALARM CIRCUIT WIRING : 16 GA.

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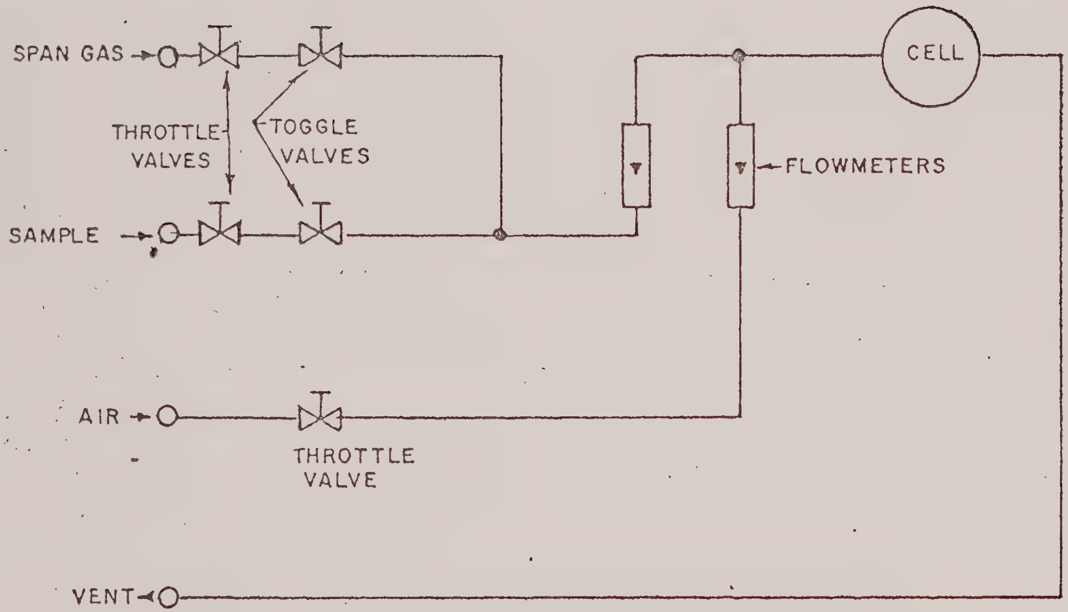
ANALYTICAL INSTRUMENTS A TELEDYNE COMPANY SAN GABRIEL, CALIFORNIA		SCALE ——	DATE 11-7-72
		MATL:	
COMBUSTIBLES ANALYZER MDL. 175 INTERCONNECTION DIAGRAM		FINISH:	
		DR G	ENGR / APP
		A-11618	

1. 11-7-72 g


SPAN GAS
THROTTLE VALVES
TOGGLE VALVES
SAMPLE
AIR
THROTTLE VALVE
VENT
FLOWMETERS
CELL

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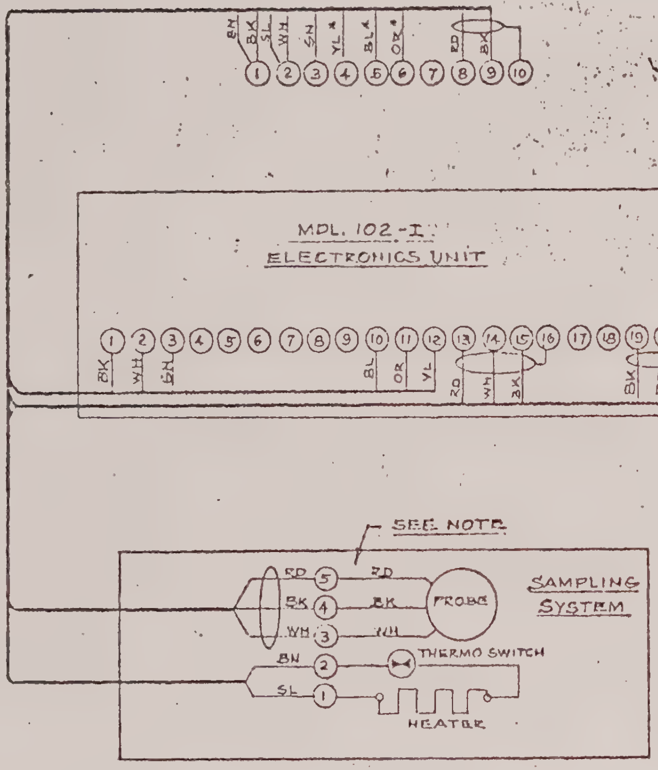
ANALYTICAL INSTRUMENTS A TELEDYNE COMPANY SAN GABRIEL, CALIFORNIA		SCALE —	DATE 11-7-72
		MATL:	
COMBUSTIBLES ANALYZER MDL. 175, 177 PIPING SCHEMATIC		FINISH:	
		DR G	ENGR
		APP	
		A- 11043	

ISSUE NO.	APP.
1. 10-9-73	
2. 11-20-74	


BN
BK
SL
WH
GN
YL *
BL *
OR *
RD
BK
1 2 3 4 5 6 7 8 9 10
MDL. 102-I
ELECTRONICS UNIT
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
BK
WH
GN
BL
OR
YL
RD
WH
BK
BK
RD
SEE NOTE
RD 5 RD
BK 4 BK
WH 3 WH
BN 2
SL 1
PROBE
SAMPLING SYSTEM
THERMO SWITCH
HEATER

NOTE: WIRES MARKED * TO BE 16 GA.
ALL OTHER WIRES 22 GA.

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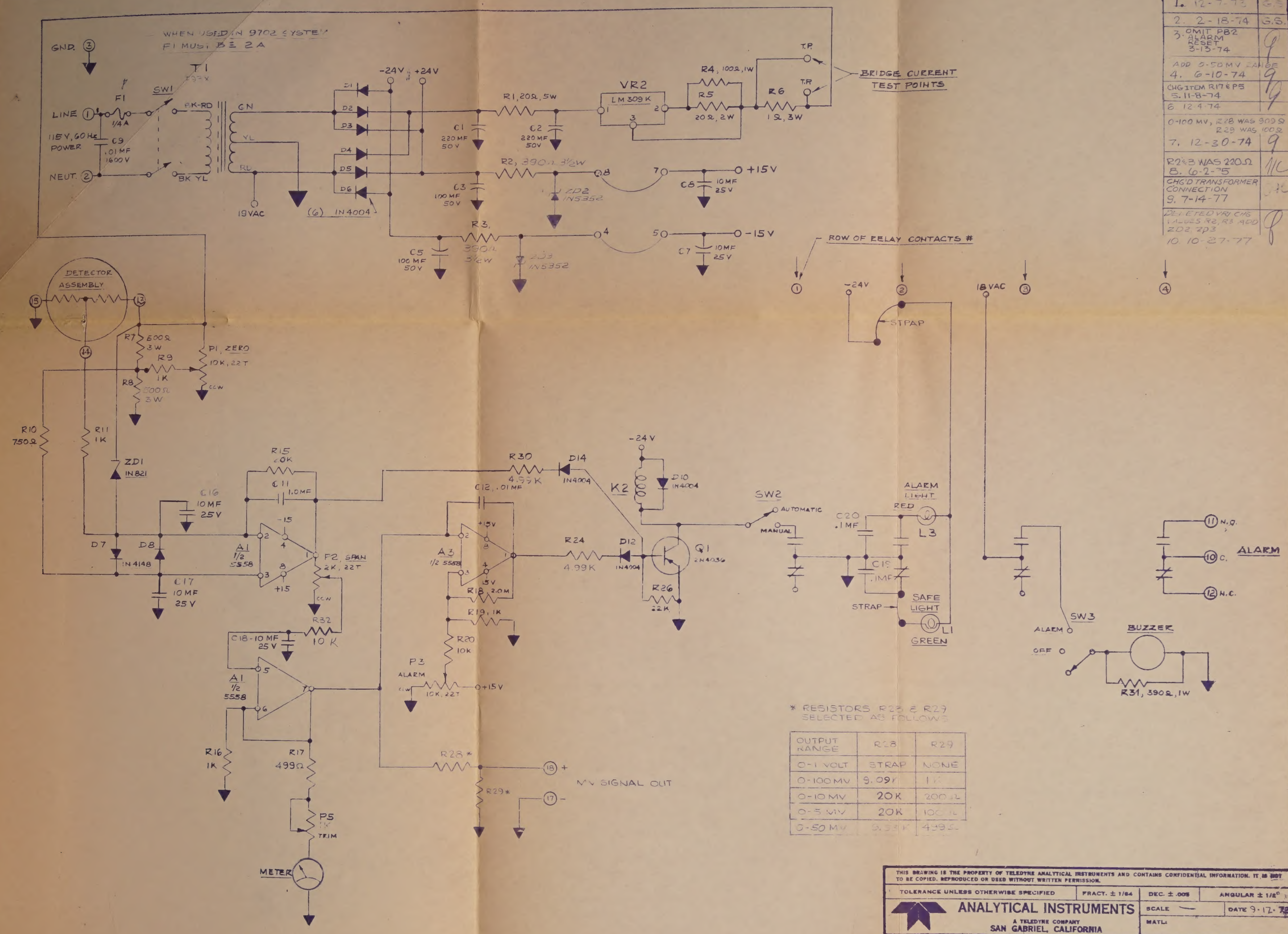
ANALYTICAL INSTRUMENTS A TELEDYNE COMPANY SAN GABRIEL, CALIFORNIA		SCALE —	DATE 10-9-73
		MAT'L	
COMBUSTIBLES ANALYZER MDL. 175 WIRING DIAGRAM		FINISH —	
		DR /	ENGR
			APP
		B-11619	


WHEN USED IN 9702 SYSTEM
F1 MUST BE 2A
GND. ③
LINE ①
115V, 60 Hz
POWER
NEUT. ②
F1
1/4A
C9
.01 MF
1600 V
SW1
T1
BK-RD
BK YL
GN
YL
RD
19 VAC
D1
D2
D3
D4
D5
D6
(6) IN4004
-24V
+24V
C1
220 MF
50 V
C2
220 MF
50V
R1, 20Ω, 5W
VR2
LM 309 K
R4, 100Ω, 1W
R5
20Ω, 2W
R6
1Ω, 3W
T.P.
T.P.
BRIDGE CURRENT
TEST POINTS
R2, 390Ω 3½W
ZD2
IN5352
C3
100 MF
50 V
+15V
C8
10 MF
25 V
R3,
390Ω
3½W
ZD3
IN5352
C5
100 MF
50V
-15 V
C7
10 MF
25 V
ROW OF RELAY CONTACTS #
①
②
③
④
-24V
STRAP
18 VAC
DETECTOR
ASSEMBLY
⑮
⑬
⑭
R7
500Ω
3W
R9
1K
R8
500Ω
3W
P1, ZERO
10K, 22T
CCW
R10
750Ω
R11
1K
ZD1
IN821
D7
D8
IN4148
C16
10 MF
25 V
C17
10 MF
25 V
R15
20K
C11
1.0 MF
A1
1/2
5558
-15
+15
F2, SPAN
2K, 22T
CCW
R32
10 K
C18-10 MF
25 V
A1
1/2
5558
R16
1K
R17
499Ω
P5
1K
TRIM
METER
C12, .01 MF
A3
1/2 5558
+15V
15V
R18, 2.0M
R19, 1K
R20
10K
P3
ALARM
10K, 22T
+15V
CCW
R30
4.99K
D14
IN4004
-24 V
K2
D10
IN4004
R24
4.99K
D12
IN4004
Q1
2N4036
R26
22K
SW2
AUTOMATIC
MANUAL
C20
.1 MF
C19
.1 MF
ALARM
LIGHT
RED
L3
STRAP
SAFE
LIGHT
L1
GREEN
SW3
ALARM
OFF
BUZZER
R31, 390Ω, 1W
⑪ N.O.
⑩ C.
⑫ N.C.
ALARM
R28 *
R29 *
⑯ +
⑰ -
MV SIGNAL OUT

ISSUE NO.	APP.
1. 12-7-73	G.S.
2. 2-18-74	G.S.
3. OMIT PB2 ALARM RESET 3-13-74	g
ADD 0-50 MV RANGE 4. 6-10-74	g
CHG ITEM R17 & P5 5. 11-8-74	g
6 12-4-74	
0-100 MV, R28 WAS 909Ω R29 WAS 100Ω 7. 12-30-74	g
R2 & 3 WAS 220Ω 8. 6-2-75	MC
CHG'D TRANSFORMER CONNECTION 9. 7-14-77	[illegible]
DELETED VR1 CHG VALUES R2, R3 ADD ZD2, ZD3 10. 10-27-77	g

* RESISTORS R28 & R29
SELECTED AS FOLLOWS

OUTPUT RANGE	R28	R29
0-1 VOLT	STRAP	NONE
0-100 MV	9.09K	1K
0-10 MV	20K	200Ω
0-5 MV	20K	100Ω
0-50 MV	9.33K	499Ω

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ANALYTICAL INSTRUMENTS
A TELEDYNE COMPANY
SAN GABRIEL, CALIFORNIA

COMBUSTIBLES ANALYZER
MDL. 102
SCHEMATIC

SCALE —
DATE 9-12-73
MATL:
FINISH:
DR G.S.
ENGR
APP
C-11751